REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Report Date (DD - MM - YYYY) Thu - 17 May 2007	2. REPORT TYPE JAWS Master's Thesis	3. DATES COVERED *(From - To)* 31 July 2006 – 15 June 2007

4. TITLE AND SUBTITLE

Solving wireless communications interoperability problems among emergency first responders depends on greater National Guard involvement

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Blair J. McFarland
GS-13, DOD

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Joint forces Staff College
Joint Advanced Warfighting School
7800 Hampton Blvd,
Norfolk ,VA 2351

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Interoperable first responder wireless communications are a key strategic requirement for effectively and efficiently responding to and recovering from man made and natural disasters. Recent major events provide terrible examples of the unnecessary loss of lives and severe confusion in which lack of interoperability played a significant role. The most successful initiatives to fix the interoperability problem are not top down federal approaches. Rather, they result from local and state personnel driving the solutions that work not only in locally handled incidents but also in larger emergencies. An effective national strategy for improving the first responder wireless communications interoperability problems depends on greater emphasis on the National Guard role in proactively interfacing with local first responders to better understand the current state of the dynamic communications environment. A National Guard situation awareness cell at each JFHQ-State, focused on first responder wireless communications interoperability within the state, is key to improving emergency response during the next national crisis.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT Unclassified	**b. ABSTRACT** Unclassified	**c. THIS PAGE** Unclassified	Unclassified	60	**19b. TELEPHONE NUMBER** *(include area code)*

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

JOINT FORCES STAFF COLLEGE
JOINT ADVANCED WARFIGHTING SCHOOL

Solving wireless communications interoperability problems among emergency first responders depends on greater National Guard involvement

By

Blair J. McFarland
GS-13, Department of Defense
17 May 07

A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

Signature: _____

Required Deliverable Date: 17 May 07

Thesis Committee: Lt Gen (Ret) Charles J. Cunningham Jr. (Chair)
Dr. Gail Nicula
Dr. Keith Dickson

Table of Contents

I.   <u>Abstract:</u>

Interoperable first responder wireless communications are a key strategic requirement for effectively and efficiently responding to and recovering from man made and natural disasters. "Communications – particularly wireless communications – are *the* critical enabler of all other functions in any disaster relief operation."[1] Recent major events provide terrible examples of the unnecessary loss of lives and severe confusion in which lack of interoperability played a significant role. These events resulted in renewed efforts from all levels of national government to fix the interoperability problem.

The breadth and complexity of the problem resulted in numerous different approaches and recommendations to improve interoperability for first responders. The most successful of these initiatives are not top down federal approaches. Rather, they result from the local and state personnel driving the solutions that work not only in locally handled incidents but also in larger emergencies.

An effective national strategy for improving the first responder wireless communications interoperability problems depends on greater involvement of the National Guard. This requires greater emphasis on the National Guard role in proactively interfacing with local first responders to better understand the current state of the dynamic communications environment. A National Guard situation awareness cell at each JFHQ-State, focused on first responder wireless communications interoperability within the state, is key to improving emergency response during the next national crisis.

---

[1] U.S. House of Representatives, Committee on Government Reform, *The need to know: Information sharing lessons for disaster response*, (Washington, D.C.: GPO, 30 March 2006): 24.

II.   <u>About the Author:</u>

Mr. Blair J. McFarland is a Department of Defense civilian currently attending the National Defense University's Joint Advanced Warfighting School in Norfolk, Virginia. Prior to joining the Department of Defense, Mr. McFarland was an Associate with Booz Allen Hamilton Inc. supporting telecommunications interoperability testing and analysis.

Mr. McFarland is also a Major in the US Army Reserves. He earned a Regular Army ROTC commission and served in both CONUS and OCONUS tactical through strategic assignments while on active duty for 8 years. Mr. McFarland has a Bachelor of Arts in International Relations from the University of Colorado, Boulder.

III.   <u>Thesis Statement:</u>

Resolving first responder wireless communications interoperability problems depends on greater involvement of the National Guard.

IV.   <u>Methodology:</u>

The author developed this paper based on research from a combination of both primary and secondary source material. Much of the material is readily available on-line from the major organizations involved in the challenge of resolving the nation wide interoperability problems. Valuable insight into the challenge from a military perspective came from informal correspondence and discussions with personnel from NORTHCOM and the National Guard Bureau. Additionally, informal discussions with communications experts from FEMA and other organizations during the 2007 DICE interoperability exercise provided excellent insight into the communication realities facing emergency responders during major events.

V.   <u>Introduction:</u>

Interoperable emergency first responder wireless communications are a vital

requirement for ensuring effective and efficient response at the tactical and operational

levels during any type of emergency. A working definition of interoperable

communications is that of "Tactical Interoperable Communications" provided by the

Department of Homeland Security (DHS).

> [T]he rapid provision of on-scene, incident-based, mission-
> critical voice communications among all first responder agencies (i.e.,
> emergency medical services [EMS], fire, and law enforcement), as
> appropriate for the incident.[2]

The vital nature of communications interoperability applies not only to routine

emergencies that are primarily confined to the local level but even more so when the

emergency exceeds the capacity of the local first responders and becomes an "Incident of

National Significance."[3] Recent "major events," like September 11, 2001 and Hurricane

Katrina in 2005, exceeded the capabilities of the local first responders and demonstrated

wireless communications interoperability is a critical component of the response effort.[4]

---

[2] U.S. Department of Homeland Security, *Tactical Interoperable Communications Scorecards Summary Report and Findings*, (Washington, D.C.: GPO, January 2007): 1; available from http://www.dhs.gov/xlibrary/assets/grants-scorecard-report-010207.pdf; internet; accessed January 11, 2007.

[3] U.S. Department of Homeland Security, *National Response Plan*, (Washington, D.C.: GPO, December 2004): 67. Incident of National Significance: Based on criteria established in HSPD-5 (paragraph 4), an actual or potential high-impact event that requires a coordinated and effective response by and appropriate combination of Federal, State, local, tribal, nongovernmental, and/or private-sector entities in order to save lives and minimize damage, and provide the basis for long-term community recovery and mitigation activities.

[4] Office of the President of the United States of America, *Homeland Security Presidential Directive/HSPD-8*, (Washington, D.C.: GPO, 17 December 2003): 2; available from http://www.whitehouse.gov/news/releases/2003/12/print/20031217-6.html; internet; accessed 8 November 2006; The term 'major events' refers to domestic terrorist attacks, major disasters, and other emergencies.

The report from the *Public Safety Communications from 9/11 to Katrina: Critical Public Policy Lessons* hearing before the Congressional Subcommittee on Telecommunications and the Internet describes numerous initiatives, committees, and programs that are working the communications interoperability challenge.[5] It emphasizes this is a national problem that needs fixing. Significant progress has occurred but much work remains.

This paper reviews some of the issues during recent Incidents of National Significance that brought failures in communications interoperability to the forefront of national attention and brought about a national outcry to fix the problems. It outlines aspects of the national security strategic and operational guidance and describes how this guidance relates to the interoperability challenge. This demonstrates that what is essentially a tactical communications issue has strategic implications and federal prioritization is necessary to solve the problem. Fortunately, the federal, state, and local leadership are making progress resulting from the national spotlight on the failures associated with improving interoperability.

Next, the paper looks at some of the initiatives addressing the challenge of interoperability, both from an operational and a technical perspective. The majority of the initiatives addressing the interoperability problem frame the solutions from the perspective of the local civilian first responders because the implementation of solutions must first and foremost solve the problem at their level.

---

[5] U.S. House of Representatives, Subcommittee on Telecommunications and the Internet of the Committee on Energy and Commerce, *Public Safety Communications from 9/11 to Katrina: Critical Public Policy Lessons*, (Washington, D.C.: GPO, 29 September 2005): 1-193.

Solving local police, fire, and Emergency Medical Service (EMS) wireless communication interoperability is the first step to ensure a comprehensive situational awareness for the nation's leadership. The lack of tactical first responder interoperability is a weakness in the Nation's ability to respond to Incidents of National Significance because non-local first responders must effectively, and efficiently, communicate with local personnel at the tactical level when responding to an incident that exceeds the local capabilities. Lack of interoperability between the local first responders, the National Guard, other military services, and other non-traditional first responders was a significant problem during recent national major events that reduced the effectiveness of the overall response effort.

An immediate reaction to the failures associated with the first responder wireless communications was the call for new technological solutions. Many proposed solutions have the potential to improve the situation and merit additional research because the national, state, and local leadership must resolve numerous technical issues preventing interoperability. Unfortunately, the technical solutions are politically charged and constrained by both time and resources. In addition, technical problems are not the only factor causing interoperability problems. Numerous human factors contribute significantly to the challenges of emergency communications.

The final section of this paper argues the key way to improve, near term, first responder interoperability is through a greater emphasis on the human element and that the National Guard is vital to this effort. As the technical solutions continue to evolve, the Nation's first responders improve interoperability during major events through a variety of non-technical approaches that emphasize training/exercises, Standard

Operating Procedures (SOP), and improved situational awareness of the first responder communications environment. The National Guard is in a unique position, due to its role as both an asset of the state governors and its role as a federal military organization. Because of this unique nexus, the National Guard should play a significant role in providing solutions to the interoperability problems of first responder wireless communications.

VI. <u>The Impact of Interoperability Problems:</u>

The organizational networks that support the emergency personnel responding to an incident are a mix of tactical and operational levels depending on the complexity and scope of the situation. At the tactical level, the "Incident Command System" provides the link between the responders relying on wireless communications equipment, who are in direct contact with those affected by the emergency, and the command and control elements trying to develop an orderly, focused, and unified effort in response to the situation.[6] Operational level communications provide the critical situational awareness link to national leaders coordinating the national response to a disaster.

The drive to bring order to a chaotic situation requires effective wireless communication at the tactical level. This is paramount in the effort to establish common understanding of the emergency environment in order to create unity of effort in the response. The first responder communications provide the decision makers with the basis of a situational awareness so they can attempt to bring order to the situation and focus the limited resources at the critical locations.

> Communications systems are key to all HD [Homeland Defense] offensive and defensive operations. Communications systems enable centralized planning and the coordinated and mutually supporting employment of forces and assets. A COP [Common Operational Picture] facilitates decentralized execution in rapidly changing operational environments. Intelligence, logistics, and operations information must be shared among appropriate agencies, to include law enforcement, when building the COP.[7]

---

[6] U.S. Department of Homeland Security, *National Incident Management System*, (Washington, D.C.: GPO, 1 March 2004): 7.

[7] U.S. Department of Defense, Joint Publication 3-26, *Homeland Security*, (Washington, D.C.:GPO, 02 August 2005): III-3.

The nature of the operational environment requires mobility and flexibility and necessitates that the first responders and the associated incident command and control personnel rely on wireless communications systems. The wireless links not only feed commanders with critical situational information, they also provide responders with the critical specific information they require to save lives. Unfortunately, interoperability problems during catastrophic emergencies can cost the lives of both civilians and first responders.

> [O]n the morning of September 11, New York police officers were able to hear the radio warnings from helicopters that the North Tower of the World Trade Center was glowing red and most of the police officers exited the building safely, while dozens of firefighters who could not hear those same warnings, tragically perished when the tower collapsed.[8]

The personnel responding to an emergency varies with each situation and the larger the scale of the incident, the greater the diversity in the responder organizations. Fire, Police, EMS, National Guard, Coast Guard, Red Cross, and many others arrive prepared to help but not necessary prepared to communicate with the other organizations responding to the disaster. The *Why Can't We Talk?* report highlights examples where many of these first responder organizations "sometimes have to juggle as many as five different radios because each agency communicates on a different system."[9]

However, as outlined in the *2006 National Interoperability Baseline Survey* conducted by the SAFECOM program, the Department of Homeland Security lead for

---

[8] House of Representatives, *Public Safety Communications*, 2.

[9] National Task Force on Interoperability, *Why Can't We Talk? Working Together to Bridge the Communications Gap to Save Lives*, (Washington, D.C.: NTFI, February 2003): 5.

fixing the national interoperability problem, local responders generally consider they

have interoperable wireless communications capabilities.

> The national interoperability baseline survey was issued to
> 22,400 randomly selected law enforcement, fire response, and
> emergency medical services (EMS) agencies, and confirms that
> roughly two-thirds of emergency response agencies across the nation
> use interoperable communications at varying degrees.[10]

Why have recent major events demonstrated interoperability is a weakness in our national

response ability if the majority of surveyed organizations indicate they "use interoperable

communications?" This disconnect may be caused by the varied concepts of

interoperable communications.

Interoperable wireless communications systems can range from well-planned,

seamless networks to solutions that rely on the experience and understanding of the first

responders because, "seamlessness does not always occur on the ground, and that a

variety of approaches are used to achieve interoperability."[11] The "variety of

approaches" techniques may work well enough but they are far from optimal.

Unfortunately, in large-scale disasters that exceed the local capabilities, the "variety of

approaches" is the required norm because the *Survey* "showed that cross-discipline and

cross-jurisdiction interoperability at local levels tends to be more advanced than it is

between state and local agencies."[12] This is a result of a combination of cultural, funding,

---

[10] U.S. Department of Homeland Security, *National Baseline Survey Findings Show Signficant Levels of Interoperability Across the* Nation, (Washington, D.C.: DHS Press Office, 8 December 2006): 1; available from http://www.safecomprogram.gov/NR/rdonlyres/7389E305-B6C3-4829-87CE-17D69800A99D/0/BaselineSurveyFindingsPressRelease.pdf; internet; accessed January 21, 2007.

[11] U.S. Department of Homeland Security, *2006 National Baseline Survey*, (Washington, D.C.: DHS-SAFECOM, December 2006): 31; available from http://www.safecomprogram.gov/NR/rdonlyres/40E2381C-5D30-4C9C-AB81-9CBC2A478028/0/2006NationalInteroperabilityBaselineSurvey.pdf; internet; accessed January 21, 2007.

[12] Department of Homeland Security, *Baseline Survey*, 1.

and organizational challenges originating at the local level but directly impacts interoperability with state and federal responders. Additionally, the Nation's first responder communications systems are a vast mix of technological solutions that have varying degrees of compatibility.

An additional point of friction is the new public concept of interoperability that results from the dramatic change in expectations in terms of daily wireless communications connectivity. These "[u]nrealistic expectations cause frustration" for both the first responders and the public and it is important to emphasize that "there has never been a perfect communications system."[13]

The explosion in the commercial wireless capabilities in the last 25 years created the expectation in today's modern communication-centric society that it is possible to communicate with voice and/or data anytime, with anyone, from just about any location around the nation. However, the modern cellular systems that create this perception have developed significantly from the initial systems. As the next section highlights, these early cellular systems share some general characteristics and interoperability problems facing public safety wireless communication systems and provide a good parallel to highlight the evolution of first responder wireless communication systems. As a result of the raised public expectations and therefore that of state and federal leadership, it is important reduce the friction by setting realistic expectations for public safety wireless communications.

---

[13] National Task Force on Interoperability, *Why Can't We Talk? Working Together to Bridge the Communications Gap to Save Lives – Supplemental Resources*, (Washington, D.C.: NTFI, February 2003): 31.

VII.   <u>The Friction of New Expectations:</u>

The nation's current public safety communication systems are far from perfect systems. Engineers designed the Land Mobile Radio (LMR) based first responder communication systems with the best technology available at the time, 20 to 30 years ago, but unfortunately many of these conventional systems still provide the primary tactical communications for the nation's emergency personnel.

In very simplified terms, conventional LMR first responder communication systems use a single dedicated frequency, or channel, to support an individual's, or group of individuals', ability to communicate. If one individual is talking, no one else can talk until the first person completes their transmission and the channel is no longer busy. If another person tried to talk at the same time as the existing conversation, the new transmission would interfere with first conversation. Sharing of this physical channel worked because established radio operational procedures ensured the priority messages received precedence. A central dispatch used broadcast messages to all users on the network to coordinate and control communications on their specific radio network. In order to allow more users to talk at the same time, more channels were required. Unfortunately, the spectrum allocated for public safety communications limited the number of available radio channels. A result, different first responder organizations used different radio networks. The distinct and limited resource systems provided effective communications but relied heavily on the human procedural techniques to establish interoperability between different organizations at the local level.

Procedural techniques ranged from relying on face-to-face communications, using 'runners' to relay information between the various agencies at a large incident scene, to swapping radios so each agency could monitor and communicate critical information as necessary. These informal work-around techniques worked well and the friction causing expectation of instant communications was not instilled in the nation at that time.

Modern commercial wireless communications systems have understandably raised public expectations for ease of transfer of critical information. However, the cellular / Personal Communications Service (PCS) providers have a major advantage over public safety organizations because the former is an industry based on the fundamental concept of providing a service to gain profit. The profit generation capability available in the commercial wireless environment is closely tied to the perception of the end user. Thus, due to the competitive environment, the commercial service providers strive to maintain and grow their customer base through the consumer perception that their network is the best in terms of things like network availability, call quality, lack of dropped calls, coverage area, and expanded features like data transfer capability and internet access.

Seamless nationwide network access/interoperability was not a feature in the early years of the cellular industry. In fact, many of the technical challenges, like limited voice-channel resources, limited coverage areas, differing technology, and lack of seamless interoperability affected and continue to affect cellular communications. The different service providers/national networks still use the technical challenges listed above as differentiators to convince consumers that their network is best. This

demonstrates that these profit driven commercial networks are not faultless communication systems.

The profit generating character of the cellular/PCS wireless industry networks versus the grant based, federal, state, and locally funded character of the first responder wireless communications networks is an important point of comparison. The centrally planned, designed, and funded national cellular/PCS networks make sure they create systems with the requisite characteristics to provide service that assures the development and retention of a customer base. The emergency first responders wireless networks developed from a decentralized local community model based on providing the basic capability needed to meet as many requirements as possible considering limited funding. The first responder systems were designed with the locality or even metropolitan area in mind, not from a nationally focused group with the goal of insuring interoperability between cities and regions.

Initial cellular systems were similar to LMR systems in the use of a single radio channel to support a mobile user's call. An automatic control process allocated the channel from pool of shared channels within a 'cell' or radio coverage area for a cellular radio base-station antenna. These initial cellular systems were also similar to LMR in that they faced the challenges of limited number of channels available, increasing demand for those channels, problems of moving between regions, interference, and lack of coverage areas. The cellular/PCS industry resolved many of these problems because consumer use, demand for better service, and the profits available to reinvest into the technology and infrastructure improvements.

Modern digital cellular communication systems demonstrate more parallels with

the evolution in public safety wireless communications.

> The cellular phone that had its commercial debut in the early
> 1980s was not the ultimate solution to the problem of rising demand
> for mobile telephone service – it was only a step along the way. . . .
> [a]s early as the late 1980s, cellular service was becoming congested
> in a few large cities, particularly New York and Los Angeles. . . . The
> next significant step in the growth of mobile telephony came from a
> series of technological developments under the rubric of digital
> cellular. . . . Digital cellular systems are divided into two general (and
> technologically incompatible) families, time division and code
> division multiple access.[14]

Just as the digital improvements did not necessarily fix the incompatibility

problems in cellular systems, digital LMR systems developed to overcome many of the

resource limitations of the early analog systems faced incompatibility problems.

> Different jurisdictions use different equipment and different
> radio frequencies that cannot communicate with one another, just as
> different computer operating systems will not work together or an
> AM receiver will not accept an FM signal. Some of the new digital
> radio communication systems will not even communicate on the same
> radio frequency because of proprietary software.[15]

The systemic reasons that contributed to the current lack of interoperability and

the public outcry based on increased expectations may finally provide the impetus to fix

this critical national strategic weakness. The public now recognizes the tragedy that non-

technical, work-around solutions are still necessary to facilitate information exchange

during major events. The scale of the required work-around techniques necessary during

---

[14] SRI Policy Division-Science, Technology and Economic Development, *The Role of NSF's Support of Engineering in Enabling Technological Innovation – Phase II*, Chapter 4: The Cellular Telephone: available from http://www.sri.com/policy/csted/reports/sandt/techin2/chp4.html; internet; accessed February 17, 2007.

[15] National Task Force, *Why Can't We Talk?*, 16.

Hurricane Katrina shocked the nation's leadership and suddenly interoperability focused

organizations were created starting at the federal level.

> I [Kevin J. Martin, Chairman, FCC] announced my intention
> to create a new Public Safety/Homeland Security Bureau. The
> Bureau will coordinate public safety, national security, and disaster
> management activities within the FCC. The Bureau will develop
> policies and rules to promote effective and reliable communications
> for public safety, national security, and disaster management.[16]

Additionally, public officials called for new emphasis on equipment requirements.

> First responders need an interoperable, mobile wireless
> communications system that can be rapidly deployed anywhere in the
> country. Such a system must have two essential features. First, the
> system must be interoperable – it must allow different organizations
> from different jurisdictions to communicate with each other
> immediately, through both voice and data transmissions. . . .Second,
> the system must be capable of rapid deployment and / or restoration.[17]

The Congressional leadership responded to the recent interoperability failures, by

initiating numerous inquiries into the challenges facing wireless interoperability across

the country and began re-examining the federal through local strategy for ensuring

interoperable emergency responder communications. The CRS Report for Congress,

Emergency Communications Legislation, 2002-2006: Implications for the 110th

Congress is an excellent, comprehensive record of the recent legislative initiatives

focused on improving interoperability. "Since September 11, 2001, successive

Congresses have passed legislation regarding technology, funding, spectrum access and

other areas critical to emergency communications."[18] Additionally, as outlined in the

---

[16] House of Representatives, *Public Safety Communications*, 22.

[17] Ibid., 23.

[18] U.S. Congressional Research Service, CRS Report for Congress, *Emergency Communications Legislation, 2002-2006: Implications for the 110th Congress*, (Washington, D.C.: CRS, 14 December 2006): 1.

next section, much of the recently published national strategic documentation elevates the

importance of interoperable first responder communications.

VIII. Federal Strategy Associated with Interoperability:

The federal strategy for solving the interoperable problems is a combination of improved guidance with greater emphasis on planning and crisis management, improved federal support to the states, and focused funding. This section highlights the strategic guidance that defines the national objectives, goals, and plans for major event preparation, response, and recovery. An important theme emphasizes that federal organizations provide the guidance and support but the actual solutions will result from state and local organizations leading the implementation of interoperable systems, plans, and procedures. Unfortunately, independent state and locally developed solutions will continue to utilize systems with varying degrees of interoperability. The result will continue to be a varying state of interoperability throughout the nation. The importance of maintaining a state wide situational awareness of the first responder communications environment will remain vital to the efficient response effort of non-local, state, and federal organizations.

The *Why Can't We Talk?* report highlights that federal recognition of the critical public safety vulnerability caused by the lack of first responder wireless communications interoperability is not a new issue.

> On September 11, 1996, 5 years before the 9/11 terrorist attack, the Public Safety Wireless Advisory Committee (PSWAC) released its final report, which stated that "unless immediate measures are taken to alleviate spectrum shortfall and promote interoperability, public safety will not be able to adequately discharge their obligation to protect life and property in a safe, efficient, and cost effective manner."[19]

---

[19] National Task Force, *Why Can't We Talk?*, 2.

Unfortunately, the limited progress on the problem was frustratingly slow. Only with the tragic interoperability problems of the recent major events, did glacial progress begin to speed up. In a typical bureaucratic reaction mode, all levels of our national and state government re-attacked the problem with new vigor. Unfortunately, the issues associated with the lack of interoperability are diverse and complex from both technological and socio-organizational perspectives and resist attempts at quick fixes.

The federal government took crucial steps to raise the importance of the interoperability issue in national security strategic documentation and it became a thread that spans the key homeland security strategic guidance and initiatives developed after September 11, 2001. This tragedy, and the recognition that the nation is at risk of future catastrophic terrorist events and natural disasters, resulted in the creation and organizational development of the Department of Homeland Security (DHS) and later to the publishing of the *National Strategy for Homeland Security* (NSHS), the nation's primary strategic document associated with homeland security.

> The U.S. government has no more important mission than protecting the homeland from future terrorist attacks. Yet the country has never had a comprehensive and shared vision of how best to achieve this goal. On October 8, I established the Office of Homeland Security within the White House and, as its first responsibility, directed it to produce the first National Strategy for Homeland Security.[20]

The creation of the DHS demonstrated the priority the nation's leaders have for safeguarding the people, culture, facilities, and economic power from mass destruction within our national boarders. The new department level organization, and vast

---

[20] U.S. Department of Homeland Security, *National Strategy for Homeland Security*, (Washington, D.C.: GPO, 16 July 2002): iii; available from http://www.whitehouse.gov/homeland/book/nat_strat_hls.pdf; internet; accessed October 6, 2006.

organizational change associated with its creation, indicated the threats to the nation had

moved beyond the capabilities of existing federal, state, and local organizations. As

defined in the National Security Act of 2002, DHS is the "focal point regarding natural

and manmade crises and emergency planning" and thus provides a national chain of

command and responsibility required for the Nation to prepare for and face the many

challenges in today's dynamic environment.[21]

The initial work conducted by the DHS focused on outlining the organizational

structure and the new security requirements in response to the threat of terrorist attacks.

The new department faced many initial challenges, one of which was the complex

requirement for coordinating national level responses to large scale disaster situations

when the majority of the actual manpower initially responding to the emergencies are

controlled at the state and local level. This is particularly important in terms of first

responder communications because the local systems are the primary operational

environment from the immediate response by local emergency personnel through the

entire response effort if the situation exceeds local capability.

Work began on strategic plans and documentation in order to meet the

requirements for establishing the new organization and to implement the Presidential

Homeland Security directives. In addition to the NSHS, Presidential Directive 5:

Management of Domestic Incidents; Presidential Directive 7: *Critical Infrastructure*

Identification, Prioritization, and Protection; and Presidential Directive 8: *National*

---

[21] The U.S. 107th Congress, *Public Law 107-296*, (Washington, D.C.: GPO, 25 November 2002): 6 USC 111, Sec.101. (b)(1)(D).

Preparedness, provide the foundation of guidance for developing national policy focused on effective homeland security.[22]

The NSHS has an explicit focus towards securing the nation against terrorism. "The purpose of the Strategy is to mobilize and organize our Nation to secure the U.S. homeland from terrorist attacks." The three principle strategic objectives identified in the NSHS further emphasize the focus on terrorism: "Prevent terrorist attacks within the United States; Reduce America's vulnerability to terrorism; Minimize the damage and recover from attacks that do occur." The NSHS highlights the fact that the strategy directly applies to all types of 'catastrophic threats' that have the potential for massive negative effects on the United States and its population, however the focus is on securing the nation against terrorism.[23]

> The National Strategy for Homeland Security attaches special emphasis to preventing, protecting against, and preparing for catastrophic threats. The greatest risk of mass casualties, massive property loss, and immense social disruption comes from weapons of mass destruction, strategic information warfare, attacks on critical infrastructure, and attacks on the highest leadership of government.[24]

The emphasis on terrorism is not surprising if taken in the context of the terrorist attacks that directly preceded the writing of the document. Unfortunately, Hurricane Katrina demonstrated that catastrophic threats to the United States are not purely based on terrorism. The focus on securing the nation against the threat of terrorism initiated the writing of the NSHS and as a result, actions implemented in response to the new national

---

[22] U.S. Department of Homeland Security, *Interim National Preparedness Goal*, (Washington, D.C.: GPO, 31 March 2005): 2.

[23] Department of Homeland Security, *National Strategy*, vii.

[24] Ibid., 2.

strategy will improve the nation's overall preparedness for both manmade and natural

events.

> We must prepare to minimize the damage and recover from any future terrorist attacks that may occur despite our best efforts at prevention. An effective response to a major terrorist incident—as well as a natural disaster—depends on being prepared. Therefore, we need a comprehensive national system to bring together and coordinate all necessary response assets quickly and effectively.[25]

The NSHS outlines the following six critical mission areas for homeland security,

two of which directly apply to both terrorist attacks and natural disasters.

> NSHS Critical Mission Areas:
> - Intelligence and warning
> - Border and transportation security
> - Domestic counterterrorism
> - Protecting critical infrastructure
> - Defending against catastrophic terrorism
> - Emergency preparedness and response[26]

Under the critical mission area of emergency preparedness and response, NSHS identifies

"twelve major initiatives" associated with the vision of "a comprehensive national system

to bring together and coordinate all necessary response assets quickly and effectively" in

order to provide comprehensive direction and facilitate unity of effort in response to

major events. This lays the groundwork for the development of the *National Incident

Management System* (NIMS). One of these specified "major initiatives" is "[e]nable

seamless communication among all responders."[27] This emphasizes first responder

interoperable communications as a strategic imperative to national security.

---

[25] Ibid., ix.

[26] Ibid., viii.

[27] Ibid., ix.

Presidential Directive 5: *Management of Domestic Incidents* tasked the Secretary

of Homeland Security to create the NIMS with the following goals:

> This system provides a consistent nationwide template to
> enable Federal, State, local, and tribal governments and private-sector
> and nongovernmental organizations to work together effectively and
> efficiently to prepare for, prevent, respond to, and recover from
> domestic incidents, regardless of cause, size, or complexity, including
> acts of catastrophic terrorism.[28]

The NIMS is the comprehensive strategy outlining the high-level operational framework

for response to major events and is based on the "appropriate balance of flexibility and

standardization."[29] Flexibility will ensure its utility and applicability to incidents of any

scope. Standardization will facilitate operational interoperability for the diverse

organizations that may respond to an incident. It "represents a core set of doctrine,

concepts, principles, terminology, and organizational processes to enable effective,

efficient, and collaborative incident management at all levels."[30]

The basic building block for the NIMS is the Incident Command System (ICS),

which is applicable to incident management across the spectrum of government levels but

recognizes that, "[m]ost incidents are managed locally."[31] The local basis for the routine

use of the standardized ICS processes results in the improved ability to scale and adjust to

major events. The guidance emphasizes the key characteristics of unity of command and

integrated communications as essential to effective incident management. It highlights

the critical requirement of interoperable communications in order to develop and

---

[28] Department of Homeland Security, *National Incident*, vii.

[29] Ibid., 3.

[30] Ibid., vii.

[31] Ibid., 7.

maintain a Common Operational Picture (COP). Unfortunately, it also recognizes that,

"much progress has been made . . . much more work remains to be done" in terms of

interoperable communications.[32]

According to the ICS outlined in the NIMS, the Communications Unit is the

primary organization responsible for ensuring effective and interoperable

communications at the incident site. It is responsible for the development of the Incident

Communications Plan during major events. The planning includes, "the use of radio

frequencies; establishing networks for command, tactical, support, and air units" and "the

development of frequency inventories, frequency-use agreements, and interagency radio

caches."[33]

The NIMS provides the operational implementation framework for the *National*

Response Plan (NRP) which is the overall national plan for integrating and managing the

federal response to major events.

> [The NRP] is an all-discipline, all-hazards plan that establishes
> a single, comprehensive framework for the management of domestic
> incidents. It provides the structure and mechanisms for the
> coordination of Federal support to State, local, and tribal incident
> managers and for exercising direct Federal authorities and
> responsibilities.[34]

Used in concert with the NIMS, the NRP provides a flexible and scalable mechanism for

"operational coordination of incident management."[35] The core of the NRP is the

detailed functional structure and the identification of the roles, responsibilities, and

---

[32] Ibid.

[33] Ibid., 83.

[34] Department of Homeland Security, *National Response*, iii.

[35] Ibid., 1.

authorities of the vast number of federal organizations that may respond to and support the recovery from a major event. Because the NRP is scalable, it provides the option for requests of specific types of federal assistance without the full implementation of the NRP as would occur in the aftermath of a catastrophic Incident of National Significance.

The NRP outlines 15 Emergency Support Functions (ESF) that are focused groups of national, both private sector and governmental, capabilities into an organizational structure. This focused grouping facilitates their implementation to support vital requirements of the state and local governments.

Communications, ESF #2, supplements the National Telecommunications Support Plan and supports the implementation of emergency telecommunications and the restoration of telecommunications impacted by an Incident of National Significance. It essentially outlines the federal plan to restore, if necessary, and coordinate the telecommunications environment in the aftermath of a catastrophic event.[36]

The responsibilities of the Federal Emergency Communications Coordinator outlined in ESF #2 are complex and emphasize the coordination with all primary federal agencies responding to the incident including deployed "military and deployed National Guard organizational telecommunications assets."[37]

When this plan is implemented, it is designed to orchestrate the many federal outsiders, all with a mission of establishing interoperable communication for their organizations, into the incident area as quickly as possible. This faces many challenges due to the poor communication environment expected during a major event. Much relies

[36] Ibid., ESF#2-1.

[37] Ibid., ESF#2-11.

on the expertise of key personnel for coordinating interoperable communications.

Detailed knowledge of the local and state emergency communications environment and

culture is essential for success.

The NSHS, NIMS and NRP are three of numerous national security doctrinal

documents that enhance the nation's ability to respond to major events. All of these

documents emphasize the importance of interoperable communications starting at the

local first responder level. The federal emphasis on local and state primacy in response

preparation derives from the belief that what the nation is securing, "extends beyond the

physical well-being of the American people. We must also safeguard our way of life,

which involves five key elements: democracy, liberties, security, economics, and

culture."[38] And fundamentally, as the NSHS points out, this is derived from the Tenth

Amendment.

> American democracy is rooted in the precepts of federalism—
> a system of government in which our state governments share power
> with federal institutions. The Tenth Amendment reserves to the states
> and to the people all power not specifically delegated to the federal
> government.[39]

The NSHS further emphasizes the state primacy in issues directly affecting their

constituents. This drives the fundamental idea that local and state authorities must

effectively develop and maintain their ability to respond to catastrophic emergencies.

> State and local levels of government have primary
> responsibility for funding, preparing, and operating the emergency
> services that would respond in the event of a terrorist attack. Local
> units are the first to respond, and the last to leave the scene. All
> disasters are ultimately local events.[40]

---

[38] Department of Homeland Security, *National Strategy*, 8.

[39] Ibid., 11-12.

[40] Ibid., viii.

Acknowledging the state and local primacy in disaster response in the federal strategic guidance emphasizes cultural limitations to federal quick fixes to the interoperability problem. As presented in this section, the federal focus on providing vital strategic and operational guidance to all states to improve planning, coordination, and response efforts to major events was an important development after September 11, 2001. Interoperable communications are an important part of ensuring the nation is better prepared. The next section reviews two key federal initiatives designed to assist state and local agencies in improving interoperability.

IX. **The Federal Response:**

The federal response to the problem of first responder interoperable communications is an unfortunate example of slow progress. Although the Congress, the Department of Justice, and other federal leadership started many initiatives associated with improving first responder communications, two primary efforts are at the forefront of the nations drive to improve interoperability. The first, Project 25, focuses on a national standard for digital LMR systems. The second, SAFECOM, is a federal program focused explicitly on improving interoperability. These two initiatives are now tied together in the national effort to achieve seamless communications during emergency response efforts.

One of the primary reasons for interoperability problems facing first responders today results from a lack of a defined national standard for public safety wireless communication systems when many of the existing systems were first installed. This, in combination with the purchasing autonomy of the local responder organizations, resulted in the continued procurement of systems without a nationally established technical requirement to interoperate with other first responder organizations. This helped create the diverse communications environment non-local emergency personnel, like the National Guard, face when responding to a major event.

The lack of a national standard was a recognized weakness back in 1989 when the Project 25 (P25) initiative started planning a digital standard for the next generation of first responder LMR systems. It developed under the joint guidance of co-directors from the Association of Public Safety Officials (APCO) and the National Association of State

Telecommunications Directors (NASTD) along with a nine person "Steering Committee" of federal, state, and local public safety officials. Additionally, equipment manufacturers were "invited and encouraged to participate" in the standard development process. The P25 participants designed the standard with the end users in mind recognizing that a digital standard was "an absolute necessity to ensure interoperability, [spectrum efficiency], multiple-source procurement, and to provide a limited guarantee against premature technology obsolescence."[41]

P25 is a multi-phase open architecture project that outlines technical specifications for first responder LMR systems with the intent of compatibility and interoperability with P25 compliant equipment. Phase I of the standard defines the starting point of the digital standard with emphasis on the Radio Frequency (RF) sub-system and the interfaces to other parts of the public safety communication network. Phase II emphasizes improved radio spectrum efficiency through different modulation techniques. Phase III focuses on defining the public safety transmission standards for high-speed data.[42]

The first phase of the P25 standard contains greater than 30 separate technical specification documents for the primary interfaces associated with first responder communications. The Common Air Interface (CAI) was first standard interface approved for deployment and US market LMR equipment manufacturers are designing and

---

[41] Federal Communications Commission, "Project 25 provides the following comments on those issues in the Docket pertaining to standardizing digital communications and related matters," *The Development of Operational, Technical and Spectrum Requirements For Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010-WT Docket No. 96-86*, (Washington, D.C.: GPO, 24 December 1997):2.

[42] Telecommunications Industry Association, "Project 25"; available from http://www.tiaonline.org/standards/technology/project_25/; internet; accessed on March 2, 2007.

building products that comply with the standard. The CAI compliant radios that are in use by first responders are primarily designed to operate in digital mode but can operate in analog mode to provide backward compatibility with legacy systems.

The Inter-Subsystem Interface (ISSI) standard was recently published and provides a significant next step in ensuring interoperability for non-local first responders by establishing Internet Protocol (IP) based inter-system communication specification. This will facilitate the mobility of a non-local P25 compliant radio user into different P25 compliant networks because key information will rapidly transfer between the networks via IP.

The successful approval of the P25 CAI was a large step toward a viable national standard for radio equipment. Once the Phase II standards are completed and approved, national interoperability may finally be technically achievable. Unfortunately, the open architecture and inter-vendor interoperability goals of the project are still encountering problems caused by "different or misinterpretation of standards."[43] Funding challenges will also prevent immediate transition to P25 systems. As a result, the public safety radio environment facing National Guard and other non-local first responders will continue to vary and present interoperability challenges for the near future.

The Federal government initiated numerous other programs associated with responder communications and interoperability. The Justice and Treasury departments developed the Public Safety Wireless Network (PSWN) program. The Advanced Generation of Interoperability for Law Enforcement (AGILE) program is another

---

[43] Federal Partnership for Interoperable Communications, "Overview, Interoperability Efforts, and P25", *Alaska Interoperability Communications Summit*, (July 2006): 10; available from http://www.nlectc.org/nlectcnw/download/downes_fpic_akinterop2006.pdf; internet; accessed on February 12, 2007.

initiative started by the Department of Justice. Although there are differences in the programs associated with their specific focus, ultimately they are working closely together to improve public safety interoperability. Eventually, the PSWN program merged with the SAFECOM program in 2003.[44]

SAFECOM started in the Office of Management and Budget (OMB) in 2001, as a presidential "e-government" initiative with the "overall objective of achieving national wireless communications interoperability among first responders and public safety systems at all levels of government."[45] Through its six-year lifespan, it has had three different changes of management. The National Security Act of 2002 created the Office of Science and Technology within DHS with the specified duty "[t]o administer a program of research, development, testing, and demonstration to improve the interoperability of voice and data public safety communications."[46] In 2003, DHS took over management of SAFECOM and it is now part of the Office of Interoperability and Compatibility (OIC) within the DHS Science and Technology Directorate's Office of Systems Engineering and Development.

SAFECOM provides "research, development, testing and evaluation, guidance, tools, and templates on communications-related issues."[47] The program focuses development of solutions with the frontline practitioners in mind, recognizing that new

---

[44] U.S. General Accounting Office, *Project SAFECOM – Key Cross-Agency Emergency Communications Effort Requires Stronger Collaboration*, (Washington, D.C.: GAO, April 2004): 8.

[45] Ibid., 1.

[46] 107th Congress, *Public Law 107-296*, 6 USC 162, Sec. 232. (b)(7).

[47] U.S. Department of Homeland Security, Science and Technology Directorate, *SAFECOM*; available from http://www.safecomprogram.gov/NR/rdonlyres/577EC88D-CE2E-419B-B7DB-50298BEEC258/0/FinalSAFECOMOnePager.pdf; internet; accessed October 14, 2006.

initiatives must meet their needs first. SAFECOM provides the federal leadership and subject matter expertise associated with the challenge of fixing the national problems of first responder interoperability.

The program received strong criticism for slow progress over the initial years because of the limited progress on its founding goal of achieving interoperability. This slow progress significantly resulted from a lack of "consistent executive commitment and support" and limited collaboration within the government.[48] In the aftermath of Hurricane Katrina, the government renewed its emphasis on interoperability and the SAFECOM program.

A key concept that SAFECOM promotes is that solving the problem of interoperability is not purely a technical issue. Director Dr. David Boyd, while testifying before a congressional panel investigating public safety communication problems in the aftermath of recent major events, emphasized this idea.

> Some seem to believe the introduction of new technologies alone can solve our interoperability problems but adding equipment addresses only part of what a fully robust, reliable and interoperable public safety communication system requires.[49]

In catastrophic events like Katrina, which severely damaged much of the communication environment, the major problem is operability. Without operability, "[i]nteroperability is both irrelevant and impossible" because "no single fix alone" could solve the myriad of problems facing basic first responder communications. In Katrina's political aftermath, "[m]any solutions have been offered and many claims have been made for each solution and all have a role, but none is a silver bullet." Quick fixes that

---

[48] General Accounting Office, *Project SAFECOM*, 2.

[49] House of Representatives, *Public Safety Communications*, 62.

call for immediate use of alternative technical solutions will create more confusion

because, "all of these without solid prior planning and appropriate training will add to the

difficulties of achieving interoperability."[50]

According to the SAFECOM "Interoperability Continuum," there are five

"critical elements for success" for interoperable solutions: "governance, standard

operating procedures, technology, training and exercises, and usage of interoperable

communications."[51] Improvements directed towards each element are essential in the

path to develop seamless first responder communications systems. Although technology

is only 20 percent of the "Continuum" and there is no single technical "silver bullet",

SAFECOM strongly encourages states consider P25 based technology when purchasing

new systems and equipment.

SAFECOM is actively involved in assisting the local, state, and regional

leadership's assessment and improvements to many parts of their communication

systems. The program conducted the *National Baseline Survey* focusing on first

responder groups to determine their perspective on their level of interoperability.

SAFECOM developed interoperability guidance to support funding allocation through

the Homeland Security Grant Program. The "Criteria for Statewide Interoperability

Strategic Plans" supports the requirement that "all states are required by December 2007

to develop and adopt statewide communications interoperability plans."[52] It provides

---

[50] Ibid.

[51] U.S. Department of Homeland Security, SAFECOM, *Interoperability Continuum*, available from http://www.safecomprogram.gov/NR/rdonlyres/54F0C2DE-FA70-48DD-A56E-3A72A8F35066/0/ContinuumBrochure.pdf; internet; accessed October 14, 2006.

[52] U.S. Department of Homeland Security, SAFECOM, *Criteria for Statewide Interoperability Strategic Plans*, available from http://www.safecomprogram.gov/; internet; accessed October 14, 2006.

recommendations of what must be included in the state plan to ensure effective interoperability. SAFECOM strongly supports the sharing of best practices among communication leadership throughout the country.

Through organizations like SAFECOM, which plays a significant role in developing nation-wide policy and coordination, to Project 25, which is leading the technical development of nation-wide standardized emergency responder communications, the nation is on a path towards improved interoperability. Local, regional, and state leadership will determine the progress made on this path through their willingness and financial ability to effectively implement the new technical standards and best practices.

X. <u>Local, Regional, and State Initiatives:</u>

Fixing interoperability problems for first responders will ultimately take place at the local, regional, and state level. As a result of the recent communications failures during major events of the past few years, state and local government have addressed greater interoperability. State and local organizations are receiving some funding earmarked for interoperability and coordination at all levels is improving. Much work remains but the renewed focus is improving the situation at a minimum by forcing leadership to take a hard look at their interoperability weaknesses. This section highlights a few initiatives laying the foundation for improved communication between first responders. They vary from a nation-wide survey conducted for the United States Conference of Mayors, to a SAFECOM sponsored regional program, to a few state interoperability plans. All provide insight into the complex problems facing the stakeholders at the local, regional, and state levels.

The United States Conference of Mayors Interoperability Survey published the findings of their 192-city survey in June of 2004. This initiative was a result of the change in the security posture of the United States that resulted from the terrorist attacks on September 11, 2001. The mayors recognized the "urgent need for interoperable communications across public safety agencies at the local, state, and federal level." They initiated the survey to improve their understanding of the problems facing their first responder personnel so they could better "advocate for the interoperable needs of cities."[53]

---

[53] The United States Conference of Mayors, *Interoperability Survey*, (Washington, D.C.: USCM, June 2004): 3.

The three goals of the survey were:

- Measure the level of interoperable communications across city; critical infrastructure located within a city, state, and federal public safety agencies
- Obtain information on obstacles to interoperability and whether the federal mechanism for distributing Homeland Security funds by states delayed city interoperable investment
- Determine the level of investment required for a city to become fully interoperable and whether and how much federal funding is expected or has been made available to aid city interoperable implementation[54]

Cities from 41 states and Puerto Rico responded to the surveys including small towns with populations of less than ten thousand to large cities with nearly 3 million residents. The results include numerous findings but the following bullets highlight alarming concerns about preparedness of the nation's cities.

- 66 percent have interoperable capability across police, fire, and EMS
- 90 percent report that they do not have interoperable capability with the National Guard
- 88 percent report that they do not have interoperable capability with Homeland Security (FEMA, Customs, Borders. . .)
- The median interoperable communications system age of cities of 100,001 to 400,00 is 11 years
- 44 percent reported that in the last 12 months there had been an incident or event either within the city or region requiring multi-agency response where the lack of interoperable communications made response difficult[55]

The survey shows that there is a variety of radio frequency bands used "to communicate with other public safety and/or public service organizations." Of the respondents, 65 percent use 800 MHz, 52 percent use 136-174 MHz, 40 percent use 450-512 MHz, 8 percent use 25-50 MHz, 3 percent use 900 MHz, and 2 percent use 700

---

[54] Ibid.

[55] Ibid., 6-8.

MHz. Forty-four percent of the respondents consider the diverse frequencies "greatly

hinder" and 31 percent consider this "moderately hinders emergency communications."

Obviously, the percentages indicate some cities use more than one band for this type of

communication but it nicely demonstrates the importance of situational awareness of the

complex communications environment.[56]

The mayoral survey provides interesting data on the local perspective of

interoperability. Unfortunately, it presents nothing to indicate how the leadership is using

the data other than providing a rather bleak set of bullets to enhance their fight for

improving the situation.

The Regional Communications Interoperability Pilots (RCIP) is a federal

initiative based on a directive from the Intelligence Reform and Terrorism Prevention Act

of 2004. The SAFECOM program serves as the primary federal coordination office for

this project that "brought together stakeholders from emergency response and public

safety disciplines at all levels of government in the State of Nevada and the

Commonwealth of Kentucky." The goal of these interoperability exercises is to assist

local and state participants in a strategic planning process that "will result in tools and

best practices to create locally-driven plans to improve public safety communications

capability that can be used by jurisdictions nationally."[57]

The state of Nevada conducted "[i]nterviews and a tabletop exercise involving

state and local agencies . . . to identify critical gaps in communications interoperability."

The state of Kentucky worked with SAFECOM during an "Interoperability

---

[56] Ibid., 9-10.

[57] U.S. Department of Homeland Security Science and Technology Directorate, *Final Report on the Regional Communications Interoperability Pilots*, (Washington, D.C.: GPO, May 2006): 2.

Communications Coordination Session to organize response efforts during Kentucky

Derby festivities" to identify interoperability gaps.[58]

The participating states and SAFECOM benefited from this initiative and

SAFECOM will publish, on their website, a few of the tools developed during this project

in an effort to assist other states in their interoperability planning processes. The final

RCIP report also listed SAFECOM "Field Observations" and "noted a variety of areas

that must be addressed in order to improve interoperable communications nationwide."

The following is a sample of the list observations:[59]

- Communities are allocating their limited funds primarily for procurement of new equipment. Most are not accounting for the costs of developing standard operating procedures (SOPs), conducting maintenance, increasing staffing, or providing training on the new equipment.
- State and local public officials must be educated on the multiple issues affecting communications interoperability. . .
- Procurement practices, as well as incident response among local agencies and between local and state agencies, often, are not coordinated.
- Most communities do not have access to independent, unbiased technical expertise.
- Achieving communications interoperability requires dedicated staff time, yet in most cases full-time public safety practitioners have to take on additional, interoperability-related responsibilities.
- Rural areas and smaller communities often are not considered or included in interoperability planning. In some cases, these groups cannot qualify for grants due to not meeting population requirements or not having matching funds, yet these groups provide a significant part of the response capability for most urban areas.
- Additional training is required in operating communications technology, which is increasingly complex and is exceeding the current skill levels of many public safety practitioners.

---

[58] Ibid., 3.

[59] Ibid., 12.

- Information on channel and frequency usage is not shared or managed among the public safety agencies, either regionally, or within the state.

The RCIP final report emphasizes their effort "to encourage a shift from a technology-centric approach to a comprehensive focus on all critical success elements for interoperability."[60] This is a critical recognition indicating that a quick technical solution for the first responder interoperability problems does not exist. Many first responders will need to rely on their existing systems for the projected future which means, using Kentucky as an example, "most public safety responders cannot communicate across jurisdictions and disciplines during day-to-day operations and large-scale incidents.[61] Many localities will continue to rely on their existing communications systems due to limited funding and the slow implementation of new systems. Thus, the RCIP program emphasizes that "formal governance structure is critical to the success of interoperability planning because it ensures that the right stakeholders are involved in the communications planning and operations process."[62] Enhancing the state planning process, training, and standard operating procedures associated with interoperability is vital.

In recognition of the importance of the planning process, one of the eligibility requirements for receiving federal grant money is the development of state interoperability plans. This warrants a look at examples of recently developed state interoperability plans. In order to demonstrate the important differences in the first

---

[60] Ibid., 16.

[61] Ibid.

[62] Ibid., 10.

responder communication environment, two states with distinctly different sizes, populations, and geography were selected. The plans for the states of Maine and Texas provide interesting insight into the different perspectives on first responder wireless communication interoperability.

The State of Maine *Communications Operations Plan (CONOPS) for Incident Communications Interoperability* provides "guidance to public safety agencies (traditional first responders) and non-traditional responders for developing and employing interoperability through an effective Incident Communications program." It emphasizes the importance of "a communications partnership . . . between all public safety agencies in the state" to ensure effective interoperability during emergency situations.[63]

This plan centers on the statewide Very High Frequency (VHF) high band radio system. Initially implemented in the early 1970's, this provided a statewide system for day-to-day police, fire, and EMS communication. Two common channels were specified for interoperability between agencies but "[t]he effectiveness of these two channels were limited" and "will not support communications during a CONOPS situation."[64]

Maine's new plan identifies six "Talk-around channels" for interoperability. Programming the channels into the police, fire, and EMS radios is the basis of their interoperability plan. Because of the limited number of VHF frequencies, these channels will be used for day-to-day operations. Upon the notification of a major event, the Maine

[63] State of Maine, *Communications Operations Plan (CONOPS) for Incident Communications Interoperability*, (Portland, ME: SOIT and MEMA, 19 July 2006): 1; available from http://www.maine.gov/tools/whatsnew/attach.php?id=22705&an=1; internet; accessed on March 5, 2007.

[64] Ibid.

Emergency Management Agency director will approve requests to activate the CONOPS

channels for a major event. Broadcast messages from communication dispatchers around

the incident will notify responders to the CONOPS use of the channels. "This CONOPS

provides incident commanders, first responders and dispatchers with a much more

efficient way to communicate with one another during upscale public safety

operations."[65]

The plan expects that "Federal, State, and non-traditional public safety agencies"

have VHF capable radios because they "will be provided with the channel/frequency

assignments . . . for use when responding to events and incidents within the state." This

is a weakness of the plan because the plan provides significantly less detail for "agencies

operating on frequencies outside the common VHF High Band Spectrum" and simply

states interoperability "will be resolved using available technologies."[66]

The *Texas Radio Communications Interoperability Plan*, focuses on outlining the

recommended way "to achieve Level-4 radio interoperability within the first responder

community throughout Texas." Level-4 interoperability is based on using bridging or

gateway equipment to interconnect different agency networks and/or different radio

systems to ensure interoperable communications.[67]

---

[65] Ibid., 3-6. Talk-around channels: Simplex, single frequency channels permitting direct point to point communications between two or more radios without the aid of repeaters or remote transmitter/receiver systems.

[66] Ibid.

[67] State of Texas, *Texas Radio Communications Interoperability Plan*: 1&7; available from http://www.txdps.state.tx.us/DEM/documents/texasradiocomminteroperabilityplan.doc; internet; accessed March 5, 2007. The plan describes how DHS identifies 6 levels of increasing interoperability: 1-Swap Radios; 2-Talkaround radio to radio frequencies; 3-Mutual Aid Channels; 4-Gateway/Bridging (Console Patch); 5-System Specific Roaming; 6-Standards Based Shared Systems.

The plan describes the geographic challenges facing the states ability to ensure interoperability and points out that "there are over 5,206 first responder agencies in Texas using various local and regional radio systems throughout the state." It also states that the police, fire, and EMS operate in as many as five different frequency bands including VHF, which is the only frequency band common to the state agencies, FBI, FEMA, and National Guard.[68]

An interesting aspect the plan points out is, "VHF frequencies . . . provide coverage to approximately 80 percent" of Texas geography but because of "lack of available spectrum and other technical limitation associated with the VHF band . . . approximately 80 percent of the population . . . is covered by 800 MHz systems." Thus, in the areas with the greatest risk based on population, the police, fire, and EMS operate using 800 MHz systems while the rest of the state agencies, FBI, FEMA, and National Guard operate using VHF.[69]

Numerous state projects are improving interoperability in regions throughout Texas. Unfortunately, the "most common approach now used in Texas during incidents to achieve interoperability is radio swapping."[70]

The Texas plan's purpose is not to describe a statewide interoperability standard operating procedure. It highlights the challenges and some regional initiatives and ultimately describes three options to achieve level-4 interoperability.

- Acquire the same P25 compliant radio system for each first responder agency

---

[68] Ibid., 11.

[69] Ibid., 12.

[70] Ibid.

·   Provide all first responders with additional radio system used within the region
·   Link existing radio systems together[71]

The first two are both financially and operationally not viable. "The only practical solution is to link radio systems together within each COG [Texas Councils of Governments]." This will continue the problem of different communication environments across the state of Texas because the "manner in which radio systems are linked within the COGs will depend on the unique variables within the regions."[72]

Surveys, regional analysis programs, and state interoperability plans contribute to improving the understanding of the communication challenges across the nation and provide some forward progress across the SAFECOM "Interoperability Continuum" but the nation remains a long way from effective interoperability. Obviously, updated and enhanced communication systems would greatly improve some of the problems facing local communities. However, this is not financially viable nationwide and many patch work systems will remain for the near future.

In the context of incidents that overwhelm the capacities of the local responders, the nation will not solve the interoperability problems with a purely monetary and technological solution. Dramatic differences caused by unique geographic, demographic, and economic aspects of states and localities will continue to challenge seamless emergency communication systems throughout the nation.

As presented in the next section, outdated, limited, incompatible, and disparate communications systems are a large problem that will continue to be part of the

---

[71] Ibid.

[72] Ibid., 13.

operational environment during major events. Additionally, other challenges that affect

interoperability go beyond the communications equipment. Many of these are human

factors associated with organizational culture and local focus in decision making

processes. These challenges significantly contribute to the inability to seamlessly

interoperate among emergency responders. Solving human/cultural challenges will

provide the most effective near term improvements while the longer term technical

solutions are progressing. Thus, situational awareness of the dynamic interoperability

environment, caused by the combination of disparate challenges and varied solutions, is

vital.

XI.   Challenges Facing a Solution:

Many challenges face the development of seamless interoperable communications systems. Dr. Linton Wells II, Principle Deputy Assistant Secretary of Defense (Networks and Information Integration), in a testimony before Congress, highlights three primary categories of actions associated with information sharing that are "necessary to ensure operability in catastrophic events: . . . technical capacity development; . . ."social network" development through planning, interaction, and collaboration; . . . doctrinal changes and training."[73]

SAFECOM indicates that there are "five key challenges" to public safety emergency response interoperability: "incompatible and aging communications equipment; limited and fragmented budget cycles and funding; limited and fragmented planning and coordination; limited and fragmented radio spectrum; limited equipment standards."[74]

Some elements of these 'challenges' were discussed earlier in this paper. A few like funding, cooperation issues associated with organization autonomy and culture, and other technical considerations warrant additional details.

The SAFECOM director, Dr. David Boyd, in his testimony before Congress, identified one of the challenges to achieving interoperability results from the inability to require the states purchase specific systems, "more than 97 percent of these systems are

---

[73] House of Representatives, *The Need to Know*, 25.

[74] U.S. Department of Homeland Security, SAFECOM, *Enhancing Communications and Interoperability: Perspectives and Key Considerations for Improving Local and State Coordination*; available from http://www.safecomprogram.gov/NR/rdonlyres/AE165BD7-80C0-4372-B29C-8ABEF06567C7/0/LocalandStateAlignmentFinal.doc; internet; accessed October 14, 2006.

funded locally, it is not Federal money." Thus, original decisions used to procure

existing systems were not based on the current expectations of interoperability. Even if

the local communities did follow federal guidelines outlined by SAFECOM, the

guidelines will not prevent "them from deploying the kind of system they want." The

reality is, "[t]he guidelines are intended to point at a way to move forward nationally

toward our goal of the system of systems" as opposed to a single nation-wide system.[75]

Over $2 billion in federal grant money was spent in the last three years for

interoperable communications.   SAFECOM can not provide grants for communications.

However, much of the federal grant allocation decisions were based on the detailed

communication systems procurement requirements established by SAFECOM.   Grant

requesters must provide detailed descriptions to ensure the compliance with focused

criteria so federal grant money is optimized for interoperability. There is a strong

emphasis on purchasing P25 compliant systems as well as an emphasis on IP based

systems for backbone connectivity between radio systems. A caveat still exists in the

guidance that allows for grants for "non-P25 equipment" but there must be strong

justification that the equipment will be used to improve interoperability. [76]

The mayoral *Interoperability Survey* paints a grim picture of the funding

requirements for fully interoperable capabilities.

> Officials in cities under 100,000 indicate an average of $4.7 million in
> interoperable funding is needed . . . for cities of 100,001 to 400,000

---

[75] House of Representatives, *Public Safety Communications*, 79.

[76] U.S. Department of Homeland Security, SAFECOM, *Recommended Federal Grant Guidance Emergency Response Communications and Interoperability Grants Fiscal Year (FY) 2007*: 12-14; available from http://www.safecomprogram.gov/NR/rdonlyres/8FE2AC9D-6E05-4713-8928-876284384E4E/0/FY07SAFECOMGrantGuidance_FINAL4_.pdf; internet; accessed on March 8, 2007.

[the amount] is $5.5 million . . . Cities over 400,001 indicate an average of $30 million is needed.[77]

Using these averages and the 122 small cities, 54 medium cities, and 16 large cities that responded to the survey indicates a total requirement of $1.3 billion. Since, as previously indicated, "$2 billion in federal grant money" went towards interoperability in the past three years, why do these cities have problems with interoperability? Possibly because "75 percent or 136 out of 192 cities reported that they have not received or been notified that they would be receiving federal funding for interoperable communications." The *Interoperability Survey* also indicates, "89 percent of the survey cities report that the largest impediment to achieving full interoperability is limited local funding."[78]

Unfortunately, the Conference of Mayors completed the *Interoperability Survey* just about 3 years ago or just before the 3-year period associated with the federal grant money statistics. Thus, a new *Survey* could show an improvement.

First responder organizational cultures are key contributing factors that create another aspect of the interoperability challenge. "The human factor is a substantial obstacle - agencies are naturally reluctant to give up management and control of their communications systems."[79] Firefighters have their own way of communicating and police have another way. A friendly rivalry has developed between them over the years. Fortunately, they put these differences aside when they work together during major events to save lives. However, the differences remain and the challenges of limited local resources create direct competition based friction between agencies. "Agencies and

---

[77] Conference of Mayors, *Interoperability Survey*, 11.

[78] Ibid.

[79] National Task Force, *Why Can't We Talk?*, 20.

jurisdictions, and different levels of government compete for scarce dollars, inhibiting the partnership and leadership required to develop interoperability."[80]

Fundamental to each branch and level of government in the United States is the ability to control the decisions that affect their constituency. Politicians and voters desire this decision-making ability at the lowest possible level. This concept is captured in the quote from the late House Speaker Thomas O'Neill, "all politics is local."[81]

In the context of interoperable first responder communications, funding plays a key role in this concept of control, as discussed previously. Additionally, the idea that voters / representatives have control over the direction and decisions affecting their first responder communications is an important stakeholder consideration. Thus, "public safety agencies have historically developed systems based on individual needs when planning a radio communications system."[82]

Numerous specific technical challenges limit or prevent interoperability of wireless communications systems. In general terms, these fall into equipment technology and limited radio spectrum resources.

The technology challenges tie directly to the history of the wireless telecommunications evolution. The first analog systems were based on simplex signals, one speaker talks while the other listens, on a single frequency. Technology improved and engineers developed half-duplex radios to improve communications. Half-duplex

---

[80] Ibid., 19.

[81] Thomas O'Neill; Available from http://www.brainyquote.com/quotes/quotes/t/thomaspo212119.html; internet; accessed on March 7, 2007.

[82] National Task Force, *Why Can't We Talk?*, 18.

radios are able to transmit on one frequency and receive on another frequency but not at the same time.

Expanding capacity initially required the allocation of additional radio frequencies. The federal government recognized that these radio frequencies are limited in supply and highly useful for many services. This resulted in grouping of specific ranges of frequencies and allocating or licensing these 'frequency bands' for specific utilization in order to prevent interference from other transmissions. Unfortunately, the frequency bands allocated for public safety are not in a single continuous band and this limits some equipment that only operates in specific bands. Newer radios can operate in multiple bands but this is not universal.

Eventually, demand exceeded supply and allocating additional frequencies was not enough. Voice coding through converting, into ones and zeros, the analog frequency wave created by speaking and digital modulation of radio frequencies improved the efficiency of the transmitted signal. This allowed more people to communicate using the same number of radio frequencies. New digital multiple access techniques expanded capacity of a single radio frequency into a small number of logical channels. This improved the situation but it still has capacity limitations.

Another key technologic improvement was 'trunking' or the controlled sharing of radio resources to limit blocked communication due to multiple users trying to use one or two channels when others are available. The trunking concept involves a number of shared communication channels, trunking capable radios and a trunking controller that tracks free channels and treats them as a pool of resources that it allocates automatically on demand.

First responder wireless communications rely on a variety of simplex, half-duplex, analog, digital, and 'trunked' radios commonly grouped into LMR technology. Unfortunately, these 'types' of radios and their required communication infrastructure do not necessarily interoperate. Some, but not all new digital systems have backwards compatibility with older analog systems. Some, but not all can operate in multiple frequency bands. Unfortunately, some but not all radios from different manufacturers of similar technological 'types' of radios do not interoperate.

In order to emphasize these systemic technical problems, the following report shows that even in a relatively small geographic area supported by a known group of local first responders, the communication environment is complex and interoperability is challenging.

The California State University Long Beach (CSULB) final report for the METRANS Transportation Center, titled *Identification of Port Communication Equipment Needs for Safety, Security, and Interoperability*, provides survey based examples of the technical challenges facing interoperability within a focused geographic and demographic group of first responders. "The purpose of the report is to identify the communication system needs of the Los Angeles port and Long Beach port public safety agencies for safety, security, and interoperability." The report surveyed members of "the California State University of Long Beach Police Department; the Port of Los Angeles Police Department, Fire Department, and security office; and the Port of Long Beach Police Department, Fire Department, and security Office." To simplify the presentation of the results, the survey grouped the respondents: Los Angeles Fire Department, Los

Angeles Police Department, Long Beach City, and California State University Long

Beach Police Department."[83]

The CSULB report references the SAFECOM "five key Challenges" for lack of

interoperability. These "roadblocks" were "confirmed" by the CSULB study which

further focuses on "equipment compatibility, and somewhat on the fragmented radio

spectrum."[84]

The "Technology Survey" section and "Data Sheets" listed in appendix C of the

CSULB report identifies two primary classes of two-way radios use by the surveyed

organizations. "Portable radios, also known as portable transceivers, are lightweight,

handheld, wireless communication units."[85] "Mobile radios are larger than portable

radios . . . and are designed to be mounted on the dash, trunk, or other fixed location

within a vehicle."[86] The 'mobile radio' equipment was comprised of ten different models

from four manufacturers. The 'portable radio' equipment included five different models

from a single manufacturer. The actual operational capabilities and configuration of the

mobile equipment varied between the four organizations and resulted in an

interoperability challenge.

> The diversity in [frequency] bands, frequency channels,
> analog/digital modes, and trunking/conventional modes for the
> equipment listed in this survey indicate there is very little equipment
> interoperability between agencies. However, some agencies have

---

[83] California State University Long Beach, *Identification of Port Communication Equipment Needs for Safety, Security, and Interoperability*, (Long Beach, CA: METRANS, May 2005): 2; available from http://www.metrans.org/research/final/Final0505YehYehVanHouten.pdf; internet; accessed February 13, 2007.

[84] Ibid., 3.

[85] Ibid., 16.

[86] Ibid., 17.

repeaters operating on bands other than the bands of their mobiles and portables, which could accommodate other agencies. . . .All agencies use cellular phones, which is a stopgap method for attaining interoperability. It is a temporary solution, since commercial systems become congested during major disasters.[87]

The CSULB report's recommendation is really just a concise summary of potential advantages of APCO P25 standards based systems but it implies that some of the surveyed organizations are "migrating to equipment using P25 standards" and this "should ensure compatibility between future and legacy systems, compatibility between different vendors, and a course for future changes."[88] The report demonstrates that even in a geographically specific group of first responder organizations, the technical challenges facing interagency interoperability are many.

There are many other examples of the challenges facing interoperability. Many technical proposals are the focus of significant national discussion. However, as SAFECOM points out "achieving interoperability requires that, in addition to addressing technology and disparate communications systems, agencies [should also] examine governance, procedures, training, exercise, and usage."[89] Thus, a purely technical solution will not solve the interoperability problem.

> The quickest way to achieve a meaningful improvement in interoperable communications capabilities is to focus on a strong governance structure, establish and maintain SOPs [Standard Operating Procedures], and ensure that solutions are used regularly and effectively.[90]

---

[87] Ibid., 22.

[88] Ibid., 26.

[89] Department of Homeland Security, *Tactical Interoperable Communications*, 5.

[90] Ibid., 6.

The challenges highlighted in this section are only a few examples of the complex aspects of the interoperability problem. The complex environment will continue to make seamless first responder communications difficult to achieve during incidents that exceed the capabilities of local responders. Non-local responders of varying experience and capabilities will continue to create a complex communication environment during major events. Prior to the requirement to respond to a major event, situational awareness of the impacted area's first responder wireless environment would significantly improve the integration of non-local responders. The National Guard could play an important role in this effort because of its extensive emergency response experience and its dual nature as an asset of both the state and federal leadership.

XII.   <u>A National Guard Situation Awareness Cell:</u>

A key consideration when discussing homeland security issues, like wireless

communications interoperability, is the role of the Department of Defense. As outlined

in Joint Publication 3-26, *Homeland Security,*

>   Homeland security (HS) is the Nation's first priority, and it
> requires a national effort. The Department of Defense (DOD) has a
> key role in that effort.[91]
>   Since many of HS objectives are best accomplished by
> building upon existing capabilities, the Federal government's role is
> to support and enhance those capabilities already at the state and local
> level.[92]

The American military has "a long and proud history" of aiding the nation in

times of great crisis. No other national organization can provide "life saving services

more quickly and more comprehensively" to the response to catastrophic events when

local and state resources are overwhelmed.[93] During the response to Hurricane Katrina,

Department of Defense forces were vital to saving lives.

> [T]he military played an invaluable role in helping the citizens
> of Louisiana, Alabama, and Mississippi respond to the devastation of
> Katrina and saved countless lives.[94]

The June 2005, *Strategy for Homeland Defense and Civil Support* provides

strategic guidance for the Department of Defense in terms of "reshaping the

---

[91] Department of Defense, *Homeland Security*, I-1.

[92] Ibid., I-5.

[93] U.S. House of Representative, *A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*, (Washington, D.C.: GPO, 15 February 2006): 201.

[94] Ibid.

Department's approach to homeland defense."[95]   It outlines the distinct differences in responsibilities between DOD and DHS. "It is the primary mission of the Department of Homeland Security to prevent terrorist attacks within the United States."[96] In contrast, the DOD responsibilities for homeland defense are, "the protection of US sovereignty, territory, domestic population, and critical defense infrastructure against external threats and aggression."[97]   The Assistant Secretary of Defense for Homeland Defense, Paul McHale, describes this distinction as,

> The difference is essentially a distinction between warfighting and law enforcement . . . [it] is captured by the distinct authorities and the types of forces that execute the missions pursuant to those authorities.[98]

The National Guard is a unique DOD organization in that it is both a state and federal asset. As a critical state organization, National Guard soldiers and airmen are trained and ready to respond when called upon by the state governor to assist in local emergencies and if necessary, enhance law enforcement capabilities. As a federal military force, the National Guard is ready to quickly integrate with federal forces when called to respond to a national emergency both domestically and internationally. Unfortunately, the balance between these two roles was significantly shifted towards the federal role due to the ongoing federal missions. Recent legislative commissions are re-

---

[95] U.S. Department of Defense, *Strategy for Homeland Defense and Civil Support*, (Washington, D.C.: GPO, June 2005): iii.

[96] Ibid., 5.

[97] Ibid.

[98] Joint Force Quarterly, *An Interview with the Assistant Secretary of Defense for Homeland Defense, Paul McHale*, (Washington, D.C., NDU Press, Issue 40, 1st quarter 2006): 10.

evaluating the role of the National Guard and Reserves based on the significant dual role

they play in homeland security and supporting DOD operations worldwide.

> The [National Guard] primarily operates under three different
> relationships: federal funding and federal control (10 USC); federal
> funding and state control (32 USC); and state status (state funding and
> state control).[99]

One of the major considerations is elevating "the role of the National Guard

Bureau in responding to domestic crisis."[100] The Honorable George W. Foresman, Under

Secretary for Preparedness, U.S. Department of Homeland Security identified that

National Guard should have a more active role in not only the national emergency

planning process but he implied that it should also be an more active player in the local

process as well.

> [W]e need to embed the National Guard more fully in our
> national civilian planning efforts, and that's not just DHS. There's a
> lot of it that goes on in state homeland security and emergency
> management offices. There's a lot that goes on at the local level.[101]

The National Guard is a respected and credible organization that the states rely on

to provide emergency response to major events. The state leadership recognizes the

important role of the National Guard as the next step beyond the local responders when

events exceed their capabilities.

> The [National Guard], when in state status, is normally the
> first military responder to [Civil Support] incidents that require
> resources beyond the capabilities of local and other state-level
> emergency response organizations.[102]

---

[99] Department of Defense, *Homeland Security*, II-12.

[100] U.S. House of Representatives, The Commission on the National Guard and Reserves, *Hearing on Proposed Changes to National Guard*, (Washington, D.C., Federal News Service, 13 December 2006): 1; available from http://cngr.gov/hearing121314/1213cngr-panel1.pdf; accessed on January 7, 2007.

[101] Ibid., 53.

[102] Department of Defense, *Homeland Security*, II-13.

The National Guard responders arrive ready to work with the local responders to improve the situation. Unfortunately, they are limited by the complex first responder communication environment and interoperability problems which degrade their efficient response capabilities.

> [T]he National Guard in Louisiana was also plagued by problems with the state's 800 MegaHertz public safety radio system, which it shares with the state's law enforcement and other public safety agencies. State officials said this system was about 11 yeas old and limited to 48 channels. They said it was not designed to handle thousands of calls, so the volume of calls after Hurricane Katrina overloaded the system.[103]

As this paper highlights, first responder communications interoperability faces many challenges and comprehensive technical solutions will take years. The state and local leadership will continue to work to improve the first responder communications systems and infrastructure. Unfortunately, the next disaster will not wait for the full implementation of these solutions. The National Guard will continue to face a dynamic communication environment whenever they are mobilized to respond to national emergencies.

The interoperability challenges are great but state and local communities are moving forward with planning and implementing new systems to enhance interoperability. This is demonstrated by Virginia's Commonwealth Interoperability Coordinator's Office *Initiative 6* that identifies a primary goal for FY2007 to, "Increase coordination and collaboration between the Commonwealth Interoperability Coordinator's Office (CICO) and the Virginia National Guard to leverage its unique

---

[103] House of Representative, *A Failure of Initiative*, 226.

federal/state capabilities." This initiative further identifies a specific task to, "Utilize the

Virginia National Guard to facilitate interoperability with U.S. Department of Defense

capabilities."[104] States recognize the importance of their National Guard's involvement

with the state initiatives to improve first responder wireless interoperability and

interoperability with other DOD organization responding to a major emergency.

Unfortunately, Virginia, like many other states, has equipment interoperability challenges

that are compounded by a serious lack of equipment.

> Current VaNG communications capability during emergencies where standard telephone and cellular service are not available or reduced is limited to the Department of Defense's (DoD) Single Channel Ground and Airborne Radio System (SINCGARS) and a small quantity of High Frequency Band (HF) Radios. This system, while adequate for communication between Army units in a tactical field environment and with VaNG personnel in fixed locations (National Guard Armories), does not provide the capability to communicate with federal, state, and local agencies to an adequate degree. Mobile and portable communications are very limited.[105]

The Virginia Commonwealth's initiative is an excellent example of state

recognition of the National Guard in improving interoperability. This however, is just the

start of a potentially critical role the National Guard can play in improving the

interoperability of first responder communications within both the state and regional

areas of the country during major incident response.

This author recommends that the National Guard Joint Force Headquarters, in

each state, (JFHQ-State) create a Communications Interoperability Situational Awareness

(CISA) cell. The cell is intended to go beyond C4 or "J6" organizational centric

---

[104] Virginia Commonwealth Interoperability Coordinator's Office, *Fiscal Year 2007 Initiative 6*; available from http://www.interoperability.virginia.gov/initiatives6.html; internet; accessed Feb 9, 2007.

[105] Virginia Commonwealth Interoperability Coordinator's Office, *National Guard Initiative*; available from http://www.interoperability.virginia.gov/nationalguard.html; internet; accessed Feb 9, 2007.

functions because it focuses on the added benefit of combining intelligence experts with

telecommunications experts. The combination of communications and network

personnel with intelligence personnel at the JFHQ-State would provide a vital

contribution to first responder communications interoperability. By focusing on detailed

network mapping of their state's first responder communications environment and

improved interoperability by focused, direct coordination with the state and local

leadership, the cell would develop and maintain a current interoperability-centric,

situational awareness for the state.

The CISA cell would support not only the existing National Guard

Communication Element (NGCE), Joint CONUS Communications Support Element

(JCCSE) and other elements that plan, implement, and operate a wide range of

interoperability equipment in response to major events. It would also support the national

Joint Communication Coordination Center (JCCC) by providing a single organizational

contact for situational awareness of interoperability within each state.

The proposed primary objectives of the CISA cell are:

- Develop and maintain a central communications reference tool
  that outlines the first responder communication networks and their
  status within the state
- Enhance the planning process for ensuring the direct
  interoperability of National Guard and Title 10 forces with local
  first responders
- Support existing National Guard deployable communications
  teams
- Develop tools and processes to enhance planning for
  interoperability issues expected during Support to Civil
  Authorities and international Humanitarian Assistance missions.

The immediate benefit is the proactive direct coordination with the local

emergency operations centers throughout the state. In states like Virginia, that have a

central interoperability coordination office, they could work directly with that office to ensure the National Guard understands the state's on-going efforts to improve the first responder communications.

The process of mapping and tracking the state's wireless first responder communication environment would directly enhance the National Guard's ability to respond to both their Title 10 and Title 32 missions. Detailed understanding of the communications environment is a critical component to both operational requirements. Effective international Humanitarian Assistance missions rely heavily on interoperable communications with other organizations. Working directly with the state leadership to create a comprehensive reference tool that outlines the state's emergency first responder communication systems is a chance for National Guard soldiers and airmen to study, with unprecedented ability, how a variety of civilian communities implement critical communication systems. Additionally, they would gain experience in the interoperability planning of non-military, non-government, and commercial organizations involved in responding to major events. Further, this consolidation of information would help highlight immediate communication interoperability problems that would facilitate the identification of requirements for National Guard response planning efforts.

The CISA cell would become the Department of Defense subject matter focal point for the communications environment for their state. It could provide expertise on current situation and the associated communications systems upgrades timelines for any planning efforts associated with each state. It would become the primary planning cell for facilitating interoperability-focused integration of any Title 10 forces for emergency response efforts within the state.

XIII.   <u>Summary and Conclusion:</u>

Recent major events brought to the forefront of public awareness the interoperability problems in the wireless communication systems used by the nation's emergency first responders. Advances in communications over the past few decades have created a high level of public expectation in the ability to communicate in a time of need. As a result, the interoperability problems severely damaged public perception of proficiency and effectiveness of the national ability to respond to major events.

The terrorist attacks of September 11, 2001 followed four years later by Hurricane Katrina, demonstrated the significance of the problem and resulted in many bureaucratic and operational efforts to improve the situation. Unfortunately, the similar interoperability problems in each event give the impression that little progress has occurred.

> Just as with September 11, during Katrina, helicopters could not communicate with rescuers on the ground. Just as with September 11, radio channels were overwhelmed with traffic. Just as with September 11, police could not talk to firefighters. Just as with September 11, those watching TV had better information than the first responders on the ground.[106]

Unfortunately, many barriers to interoperability continue to exist in the current communication environment throughout the nation. This results in a complex and dynamic environment as states work to improve interoperability for their first responders. The in-ability to effectively and efficiently communicate slows response efforts and as a result, prolongs suffering for victims. Additionally, it increases the level of friction and confusion affecting first responders who willingly go in harms way to saving lives.

---

[106] House of Representatives, *Public Safety Communications*, 5. Quote from Michigan Congressman Bart Stupak.

These brave men and women who head towards the tragedy rather than fleeing the scene demonstrate the true definition of selfless service.

> America's first line of defense in the aftermath of any terrorist attack is its first responder community—police officers, firefighters, emergency medical providers, public works personnel, and emergency management officials. Nearly three million state and local first responders regularly put their lives on the line to save the lives of others and make our country safer.[107]

National Guard soldiers and airmen are part of "America's first line of defense." When an emergency exceeds the capabilities of the local first responders, the National Guard is quick to respond. It brings manpower, equipment, supplies, and capabilities vital to the recovery effort but requires, like all other responders, effective interoperable communications to efficiently get the job done.

Numerous issues prevent seamless emergency responder wireless communications, and examples like the funding, culture, and technical issues will continue to plague efforts to resolve the situation in the near term. Although the federal leadership will continue to demand solutions, a quick federal fix will not happen. Determined local and state officials will generate successful solutions appropriate to their area of concern. Coordination and coordinated planning efforts have improved the interoperable practices however, complex emergency first responder wireless communication environments with unique characteristics in each state, will continue to exist. As a result, situational awareness of the operational environment is key to successful integration of non-local responders, like the National Guard, during major events. This places greater emphasis on the both the human/cultural and technological aspects as opposed to just the technological characteristics of the interoperability

---

[107] Department of Homeland Security, *National Strategy*, ix.

problem. A National Guard Communications Interoperability Situational Awareness cell, focused on the complex and dynamic first responder communications environment in each state, would be a significant resource for improving emergency responder interoperability during the next major event.

XIV. <u>Bibliography:</u>

<u>Federal Government Publications:</u>

Federal Communications Commission, "Project 25 provides the following comments on those issues in the Docket pertaining to standardizing digital communications and related matters," *The Development of Operational, Technical and Spectrum Requirements For Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010-WT Docket No. 96-86*, Washington, D.C.: GPO, 24 December 1997.

Federal Partnership for Interoperable Communications, "Overview, Interoperability Efforts, and P25", *Alaska Interoperability Communications Summit*, July 2006. Available from http://www.nlectc.org/nlectcnw/download/downes_fpic_akinterop2006.pdf. Internet; accessed on February 12, 2007.

National Institute of Justice, National Task Force on Interoperability Brochure, *When They Can't Talk, Lives Are Lost*, Washington, D.C.: NIJ, February 2005. Available from http://www.ncjrs.gov/pdffiles1/nij/211512.pdf. Internet; accessed February 17, 2007.

National Task Force on Interoperability, *Why Can't We Talk? Working Together to Bridge the Communications Gap to Save Lives*, Washington, D.C.: NTFI, February 2003.

National Task Force on Interoperability, *Why Can't We Talk? Working Together to Bridge the Communications Gap to Save Lives-Supplemental Resources*, Washington, D.C.: NTFI, February 2003.

Office of the President of the United States of America, *Homeland Security Presidential Directive/HSPD*-8, Washington, D.C.: GPO, 17 December 2003. Available from http://www.whitehouse.gov/news/releases/2003/12/print/20031217-6.html. Internet; accessed 8 November 2006.

U.S. Congressional Research Service, CRS Report for Congress, *Emergency Communications Legislation, 2002-2006: Implications for the 110th Congress*, Washington, D.C.: CRS, 14 December 2006.

U.S. Department of Defense, Joint Publication 3-26, *Homeland Security*, Washington, D.C.:GPO, 02 August 2005.

U.S. Department of Defense, *Strategy for Homeland Defense and Civil Support*, Washington, D.C.: GPO, June 2005.

U.S. Department of Homeland Security, *Interim National Preparedness Goal*, Washington, D.C.: GPO, 31 March 2005.

U.S. Department of Homeland Security, *2006 National Baseline Survey*, Washington, D.C.: DHS-SAFECOM, December 2006. Available from http://www.safecomprogram.gov/NR/rdonlyres/40E2381C-5D30-4C9C-AB81-9CBC2A478028/0/2006NationalInteroperabilityBaselineSurvey.pdf. Internet; accessed January 21, 2007.

U.S. Department of Homeland Security, *National Baseline Survey Findings Show Significant Levels of Interoperability Across the* Nation, Washington, D.C.: DHS Press Office, 8 December 2006. Available from http://www.safecomprogram.gov/NR/rdonlyres/7389E305-B6C3-4829-87CE-17D69800A99D/0/BaselineSurveyFindingsPressRelease.pdf. Internet; accessed January 21, 2007.

U.S. Department of Homeland Security, *National Incident Management System*, Washington, D.C.: GPO, 1 March 2004.

U.S. Department of Homeland Security, *National Response Plan*, Washington, D.C.: GPO, December 2004.

U.S. Department of Homeland Security, *National Strategy for Homeland Security*, Washington, D.C.: GPO, 16 July 2002. Available from http://www.whitehouse.gov/homeland/book/nat_strat_hls.pdf. Internet; accessed October 6, 2006.

U.S. Department of Homeland Security, *Tactical Interoperable Communications Scorecards Summary Report and Findings*, Washington, D.C.: GPO, January 2007. Available from http://www.dhs.gov/xlibrary/assets/grants-scoredard-report-010207.pdf. Internet; accessed January 11, 2007

U.S. Department of Homeland Security, SAFECOM, *Criteria for Statewide Interoperability Strategic Plans*. Available from http://www.safecomprogram.gov/. Internet; accessed October 14, 2006

U.S. Department of Homeland Security, SAFECOM, *Enhancing Communications and Interoperability: Perspectives and Key Considerations for Improving Local and State Coordination*. Available from http://www.safecomprogram.gov/NR/rdonlyres/AE165BD7-80C0-4372-B29C-8ABEF06567C7/0/LocalandStateAlignmentFinal.doc. Internet; accessed October 14, 2006.

U.S. Department of Homeland Security, SAFECOM, *Interoperability Continuum*. Available from http://www.safecomprogram.gov/NR/rdonlyres/54F0C2DE-FA70-48DD-A56E-3A72A8F35066/0/ContinuumBrochure.pdf; Internet; accessed October 14, 2006.

U.S. Department of Homeland Security, SAFECOM, *Recommended Federal Grant Guidance, Emergency Response Communications and Interoperability Grants Fiscal Year (FY)* 2007. Available from http://www.safecomprogram.gov/NR/rdonlyres/8FE2AC9D-6E05-4713-8928-876284384E4E/0/FY07SAFECOMGrantGuidance_FINAL4_.pdf. Internet; accessed March 8, 2007.

U.S. Department of Homeland Security, Science and Technology Directorate, *Final Report on the Regional Communications Interoperability Pilots*, Washington, D.C.: GPO, May 2006.

U.S. Department of Homeland Security, Science and Technology Directorate, *SAFECOM*. Available from http://www.safecomprogram.gov/NR/rdonlyres/577EC88D-CE2E-419B-B7DB-50298BEEC258/0/FinalSAFECOMOnePager.pdf. Internet; accessed October 14, 2006.

U.S. General Accounting Office, *Project SAFECOM – Key Cross-Agency Emergency Communications Effort Requires Stronger Collaboration*, Washington, D.C.: GPO, April 2004.

U.S. House of Representative, *A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*, Washington, D.C.: GPO, 15 February 2006.

U.S. House of Representatives, Committee on Government Reform, *The Need to Know: Information Sharing Lessons for Disaster Response*, Washington, D.C.: GPO, 30 March 2006.

U.S. House of Representatives, Subcommittee on Telecommunications and the Internet of the Committee on Energy and Commerce, *Public Safety Communications from 9/11 to Katrina: Critical Public Policy Lessons*, Washington, D.C.: GPO, 29 September 2005.

U.S. House of Representatives, The Commission on the National Guard and Reserves, *Hearing on Proposed Changes to National Guard*, Washington, D.C., Federal News Service, 13 December 2006, available from http://cngr.gov/hearing121314/1213cngr-panel1.pdf; accessed on January 7, 2007.

The U.S. 107th Congress, *Public Law 107-296*, Washington, D.C.: GPO, 25 November 2002.

The United States Conference of Mayors, *Interoperability Survey*, Washington, D.C.: USCM, June 2004.

Website Sources:

California State University Long Beach, *Identification of Port Communication Equipment Needs for Safety, Security, and Interoperability*, Long Beach, CA: METRANS, May 2005. Available from http://www.metrans.org/research/final/Final0505YehYehVanHouten.pdf. Internet; accessed February 13, 2007.

O'neill, Thomas P. *all politics is local*. Available from http://www.brainyquote.com/quotes/quotes/t/thomaspo212119.html. Internet; accessed on March 7, 2007.

SRI Policy Division-Science, Technology and Economic Development, *The Role of NSF's Support of Engineering in Enabling Technological Innovation – Phase II*, Chapter 4: The Cellular Telephone: available from http://www.sri.com/policy/csted/reports/sandt/techin2/chp4.html; Internet; accessed February 17, 2007.

State of Maine, *Communications Operations Plan (CONOPS) for Incident Communications Interoperability*, Portland, ME: SOIT and MEMA, 19 July 2006: Available from http://www.maine.gov/tools/whatsnew/attach.php?id=22705&an=1. Internet; accessed on March 5, 2007.

State of Texas, *Texas Radio Communications Interoperability Plan*: Available from http://www.txdps.state.tx.us/DEM/documents/texasradiocomminteroperabilityplan.doc. Internet; accessed March 5, 2007.

Telecommunications Industry Association, "Project 25" Available from http://www.tiaonline.org/standards/technology/project_25/. Internet; accessed on March 2, 2007.

Virginia Commonwealth Interoperability Coordinator's Office, *Fiscal Year 2007 Initiative 6*. Available from http://www.interoperability.virginia.gov/initiatives6.html. Internet; accessed February 9, 2007.

Virginia Commonwealth Interoperability Coordinator's Office, *National Guard Initiative*. Available from http://www.interoperability.virginia.gov/nationalguard.html. Internet; accessed February 9, 2007.

<u>Additional Reference Material:</u>

Joint Force Quarterly, *An Interview with the Assistant Secretary of Defense for Homeland Defense, Paul McHale*, Washington, D.C., NDU Press, Issue 40, 1st quarter 2006.